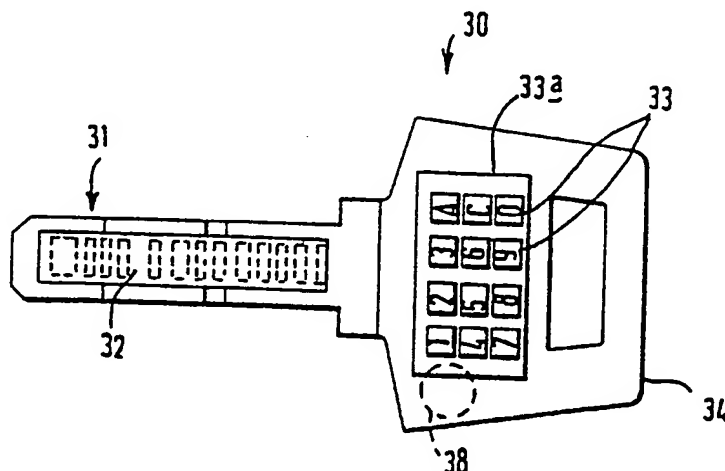




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(54) Title: ELECTRONIC LOCK AND KEY



## (57) Abstract

A key (30) has a liquid-crystal display (32) for presenting information which is to be read from the key by a lock. Operation of the display is dependant upon appropriate information being applied by a user to a key-pad (33) on the key.

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## Title:

Electronic lock and key

Description of Invention

From one aspect, the present invention relates to the use of an information carrier to set apparatus in an operating condition. The invention also relates to an information carrier and to apparatus incorporating a reader for receiving information from the carrier.

5 Information carriers which present information in machine-readable form are commonly used to apply to a reader information which identifies a prospective user of apparatus. Such apparatus may be a cash dispenser or apparatus for controlling access by persons to a room or area. Information  
10 read by the reader can be processed to determine whether the user identified by the information is authorised to use the apparatus. Furthermore, the information can be used to compile a record of users of the apparatus.

According to a first aspect of the invention, there is provided a combination comprising an information carrier and a reader for reading  
15 information presented by the carrier, wherein the information carrier is settable in a first condition in which it presents to the reader a predetermined set of information or a selected one of a plurality of predetermined sets of information and the information carrier can assume a second condition in which it does not present said predetermined set of information or said selected set of information.

20 Whilst the information carrier is in the second condition, the information presented when the carrier is in the first condition cannot be read from the carrier by unauthorised persons. The arrangement may be such that even the authorised user cannot read from the carrier the information presented when the carrier is in the first condition.

25 The combination is preferably such that a cycle of changes between the first and second conditions of the information carrier can occur a plurality of times, preferably an indefinite number of times.

The information carrier may comprise presentation means which is accessible to the user for setting of the carrier in the first condition, the



presentation means then presenting information for reading by the reader. In this case, setting of the carrier may involve relative movement of elements of the information carrier.

5 Alternatively, the information carrier may include a receiver for receiving information from a user, presentation means for presenting information to the reader and control means for controlling the presentation means in accordance with input information applied by a user to the receiver. The input information may be identical with the information presented to the reader. However, it is preferred that the input information differs from the information presented to the reader other than by the manner in which the  
10 information is presented.

There is preferably provided means for returning the information carrier from the first condition to the second condition. Such means may be incorporated in the information carrier, for example being adapted to change  
15 the condition of the carrier after elapse of a predetermined interval of time. Alternatively, said means may be provided in the reader.

According to a second aspect of the invention, there is provided a method of operating apparatus wherein an information carrier is applied to the apparatus, information is read from the carrier by the apparatus, reading  
20 of said information from the carrier by the apparatus promotes or enables operation of the apparatus, wherein the information carrier is caused to assume prior to, during or after application of the carrier to the apparatus a first condition in which the carrier presents said information for reading by the apparatus and wherein the information carrier is previously in and/or  
25 assumes subsequently a second condition in which the information carrier does not present said information for reading by the apparatus.

The information carrier may be a key capable of moving one or more components of the reader for operating apparatus which incorporates the reader or establishing an operative condition of that apparatus.

30 According to a third aspect of the invention, there is provided a method of operating apparatus wherein an information carrier is applied to the apparatus, information is read from the carrier and is represented in the apparatus by an electrical signal and wherein the information carrier is used also to move one or more components of the apparatus and thereby either  
35 operate the apparatus or establish an operative condition of the apparatus.

There may be applied to the apparatus, in succession, a number of different carriers which present to the apparatus information which differs from one carrier to another.

Movement of said component of the apparatus by a carrier applied to the apparatus may occur after information has been read by the device from the carrier. Information may be read during movement of the carrier relative to the apparatus.

5 Information read by the apparatus from a carrier may be stored in a memory of the apparatus and/or compared with information already held in a memory of the apparatus.

The information carrier may act directly on said component or components of the apparatus, for example engaging and displacing one or  
10 more tumblers or transmitting drive from a user of the information carrier to a component of the apparatus. Alternatively, a field associated with the carrier may act on a component of the apparatus to move that component.

According to a fourth aspect of the present invention, there is provided a method of operating an apparatus wherein a first set of information is  
15 applied to an information carrier, the carrier adopts, in response to receipt of said first set of information, an active condition in which it presents a second set of information in a machine-readable form, the second set of information is transferred from the carrier to a reader of said apparatus and the apparatus adopts an operating condition in response to receipt of said second  
20 set of information.

The carrier preferably resumes an inactive condition, in which it does not present the second set of information, after the second set of information has been transferred to the reader. Return of the carrier to an inactive condition may occur automatically after elapse of a predetermined period of  
25 time or be caused by a signal applied to the carrier, either by the user or by the apparatus, for example when the apparatus adopts its operating condition.

In a case where each of the first and second sets of information is a number, for example a binary encoded number, the numbers may be identical. However, it is preferred that the second set of information differs from the  
30 first set other than by the manner in which it is presented.

According to a fifth aspect of the invention, there is provided, in combination, a reader and an information carrier, the information carrier having presentation means for presenting information to the reader an input  
35 receiver for receiving input information from a user and control means for controlling the presentation means in accordance with input information applied to the receiver and the reader being adapted to read from the presentation means a set of information presented thereby.

- 4 -

The input receiver of the carrier may be manually actuatable. In this case, the user can enter the input information by manual operation of the input receiver.

5 The input receiver may comprise a single element which is sensitive to touch or to pressure. However, it is preferred that the input receiver should include more than one element which is sensitive to touch or to pressure exerted by a user. Three input elements can be used conveniently. Alternatively, the input receiver may comprise ten or more input elements designated by respective numbers.

10 Alternatively or additionally, the input receiver may be adapted to receive information other than by manual operation of input elements. The input receiver may be adapted to receive information in the form of electrical or acoustic signals. In this case, a user can apply input information to the input receiver remotely.

15 The information carrier preferably comprises a memory for storing a set of input information and for storing one or more sets of information which can be transferred to the reader. The control means of the carrier may comprise processing means for comparing input information with information in the memory and for selecting from the memory in accordance with the input information further information which is to be presented to the reader.

20 The presentation means may be adapted to present the information in a form such that the information can be transferred to the reader by radiation. For example, the presentation means may comprise a source of radiation or means for inhibiting transmission of radiation between the carrier and the reader. The presentation means may comprise a window which is transparent to radiation emitted by the reader and elements in the window which can be set in a condition in which the elements interrupt transmission of radiation to a receiver in the reader. Alternatively, the elements may be settable in a condition in which they reflect radiation to the receiver of the reader.

25 30 Elements of the set of information transferred from the carrier to the reader may be transferred concurrently or serially.

35 Information transferred from the carrier to the reader may be used to change the information stored in a memory associated with the reader, so varying the response of the apparatus to certain sets of information presented by a carrier and enabling a carrier which presents a different set of information to cause the apparatus to adopt the operating condition.

- 5 -

According to a sixth aspect of the invention, there is provided a method of operating apparatus by means of a key, wherein the key is applied to the apparatus, information is transferred from the key to the apparatus by radiation or by a field, the apparatus assumes an operating condition in response to transfer of said information, the key is turned to transmit mechanical drive to the apparatus and a receiver for said radiation or field is moved, after the transfer of said information has occurred, away from a longitudinal axis of the key.

According to a further aspect of the invention, there is provided the combination of a lock and a key wherein the key bears information by which the key can be identified, the lock includes reading means for reading information from the key, the reading means is adapted to respond to radiation or to a field, the lock includes a driven element arranged to be engaged by and to be driven by the key, the reading means comprises a receiver for said radiation or field and there is provided means for guiding the receiver along a path towards and away from an axis of the key.

With this arrangement, information can be read from the key with high definition whilst the receiver is relatively close to the key and the receiver can then be moved further from the key so that the key can be turned about its axis relative to the receiver. Thus, it is not necessary for the receiver to participate in the turning movement of the key.

The reading means may further comprise an emitter of radiation received by the receiver or a source of a field.

The information may be transferred from the key to the apparatus after the key has been inserted, but it is preferred that the information be transferred from the key to the apparatus whilst the key is being inserted. In the latter case, a single receiver can receive information from successive parts of the key as the key moves past the receiver. The reading means may comprise a plurality of receivers for receiving information concurrently from respective parts of the key.

There is preferably provided means for moving the receiver away from the axis of the key when the key is turned about its axis.

The apparatus may be operated by different keys in succession and different information be transferred from each key to the apparatus.

An example of apparatus which is operated by a method in accordance with the present invention and examples of information carriers and reader in accordance with the invention will now be described, with reference to the accompanying drawings, wherein:-

- 5       FIGURE 1 shows diagrammatically certain parts of the apparatus;  
FIGURE 2 is an elevation of an information carrier;  
FIGURE 3 is a side view of the information carrier;  
FIGURE 4 is an elevation of a further information carrier; and  
FIGURE 5 is a perspective view of a still further information carrier.

10       The apparatus illustrated in Figure 1 is arranged as a lock which is suitable for controlling opening of a door and thereby controlling access to a room or other area. Alternatively, the lock may be arranged to control opening of a container, for example a safe or a cabinet containing documents.

15       For operating the apparatus, there is provided an easily portable information carrier formed as a key 30.

20       The apparatus includes a body, a part of which is shown at 10 and which would typically be fixed in or on the door to be controlled. A driven member 11 is mounted in the body 10 for rotation relative thereto about an axis 12. A bolt 13 is guided by the body (by means not illustrated) for reciprocating movement transversely of the axis 12 between a projected position in which the bolt secures the associated door in a closed position, and a withdrawn position in which the bolt permits opening of the door. The driven member 11 is connected with the bolt 13 through the intermediary of a cam mechanism (not shown) so that the bolt can be reciprocated by rotation of the driven member. Springs may be associated with the bolt and/or with the driven member 11 to urge these towards predetermined positions in a known manner.

25       There is also associated with the driven member 11 an electrical switch 14 incorporating a contact carrier (not shown) connected with the driven member 11 to rotate therewith.

30       The particular form of the bolt 13 and of the associated cam mechanism does not form part of the present invention. It will be appreciated that the bolt may be adapted to operate as a latch, being moved to its projected position by a spring so that the driven member 11 is required to move the bolt in one direction only. The cam mechanism may be a double throw arrangement which requires rotation of the driven member through two  
35       complete revolutions, in order to withdraw the bolt from its projected position.



- 7 -

Electrically energisable control means 15 is provided in the body for controlling rotation of the driven member 11. The control means includes a plunger 16 which is urged by a spring (not shown) into a projected position where it engages in a recess formed in the driven member 11 at a position spaced from the axis 12. Only when the control means 15 is energised to withdraw the plunger from the recess in the driven member, is the driven member free to rotate about the axis 12.

The driven member 11 is formed with a rectilinear slot for receiving a shank 31 of the key shown in Figure 2. A longitudinal centreline of the slot coincides with the axis 12. The profile of the key shank in a plane perpendicular to its length and the profile of the slot in a plane perpendicular to the axis 12 are complementary and non-circular so that, when the key shank has been introduced into the slot, torque can be transmitted to the driven member 11 by the key from a user holding a handle 34 of the key.

Within the body 10, there is provided reading means for reading information from the key. In the example illustrated, the reading means is adapted to read information from the key during insertion of the key into the driven member 11. The reading means incorporates a pair of emitters 20 of infra-red radiation and a pair of receivers 21 for receiving radiation which passes from respective ones of the emitters 20 through the shank of the key. Accordingly, the emitters 20 are disposed at one side of the driven member 11 and the receivers 21 are disposed at an opposite side thereof. Windows 22 are provided in the driven member to permit transmission of the radiation.

The reading means further comprises a pair of carriers 23 and 24 disposed within the body 10 and guided by formations on the body cooperating with complementary formations on the carriers for movement along respective rectilinear paths towards and away from the axis 12. The emitters 20 are mounted in the carrier 23 and the receivers 21 are mounted in the carrier 24. The carriers are urged towards the axis 12 by springs 25 so that the carriers normally abut the driven member 11 and both the emitters 20 and receivers 21 lie close to the axis 12 and to the shank of the key, when inserted into the driven member. This arrangement enables the elements on the key shank to be read with relatively high definition.

In the example illustrated, the receivers 21 are transducers which provide an electrical output when they are subjected to incident infra-red radiation. They are connected by suitable wiring (not shown) with the control means 15. In an alternative arrangement, the receivers 21 are passive optical

elements connected by light guides with respective transducers which are mounted at fixed positions in the body 10.

5 In a case where the receivers are passive optical elements, they may be positioned more closely together than can electrical transducers. Similarly, the emitters 20 may be electrically energisable sources of infra-red radiation connected by suitable wiring with a source of electric power. Alternatively, the emitters 20 may be passive optical elements connected by flexible light guides with stationary sources of infra-red radiation or a single stationary source of infra-red radiation.

10 In a further alternative arrangement, electrical transducers which are spaced a convenient distance apart may be mounted on the carrier 24 and connected by light guides with respective optical elements mounted more closely together on the carrier. These transducers would be connected by suitable wiring with the control means 15. In a case where the emitters 20 are passive optical elements, these may be connected by light guides with one or more infra-red sources also carried on the carrier 23.

20 It will be appreciated that the reading means may comprise a single emitter 20 on the carrier 23 and a single receiver 21 on the carrier 24 and in the description which follows, it will be assumed that a single emitter and a single receiver are provided.

25 The control means 15 incorporates first and second memories and means for comparing with information stored in the first memory information read from a key inserted into the driven member 11. The first memory may be a read only memory. Alternatively, provision may be made for changing the information stored in the first memory.

30 The second memory is capable of storing information identifying successive keys which are inserted into the driven member 11. The second memory may also store additional information, for example the time at which each key is applied to the apparatus, and provision is made for extracting information from the second memory, for example to provide a written record of the use of different keys to operate the apparatus.

Electrical power may be supplied to the control means 15 from a mains supply and/or from a battery. A battery, for example a stand-by battery, may be housed in the body 10.

35 Whilst operation by means of the key shown in Figure 2 of apparatus incorporating a bolt and an electrical switch will be described, the key may be used in a corresponding manner to operate or to set in an operative condition other apparatus, for example a cash dispenser or a telephone.

5 The key 30 includes a shank 31 incorporating presentation means capable of presenting information to the reading means. In the example illustrated, the presentation means is not directly accessible to a user and is a liquid crystal array, cells of which can be set independently either in a condition in which the cells transmit incident infra-red radiation or in a condition in which the cells interfere with transmission of infra-red radiation through the array. The key incorporates suitable control means 33<sub>a</sub> for controlling the liquid crystal display.

10 The key further comprises an input receiver for receiving input information from a user. In the example illustrated, the input receiver comprises twelve manually operable elements 33 mounted in a handle 34 of the key. Respective numbers and letters are marked on the elements 33 to facilitate identification of the elements by a user.

15 The elements 33 are provided with respective switches or otherwise arranged in a known manner to provide electrical output signals when the elements are touched or are subjected to pressure by a user. The control means of the key includes a memory wherein there are stored one or more sets of information which can be presented by the liquid crystal display.

20 The input receiver of the key may alternatively comprise a single element or a pair of elements which respond to touch or pressure by providing electrical output signals. Whilst we prefer to provide an input receiver capable of receiving a selected one of a variety of sets of information, the input receiver may alternatively be arranged to respond to a single signal, for example to act as an on-off switch for the key.

25 As shown in Figure 3, the shank 31 of the key is provided with forwardly facing shoulders 35 and 36 which are spaced apart along the shank. In the driven member 11, and preferably adjacent to the mouth of the key slot, there is provided means 37 for responding to movement of the shoulders 35 and 36 into the key slot to provide an electrical signal to the control means 15. This signal may be used to energise the reading means when insertion of the key shank into the driven member 11 is commenced. As the key shank moves past the emitter 20 and receiver 21, the liquid crystal display is scanned by the infra-red beam. Certain elements of the display are opaque to the infra-red beam, whilst other parts transmit the beam. There is thus obtained from the receiver 21 a train of pulses which represents information presented by the liquid crystal display. This information is transferred to the control means 15, where it is compared with information in the first memory of the control means.

30

35

The key shank 31 may be provided, in addition to the liquid crystal display 32, with a clock track which is read by a second emitted-receiver pair of the reading means and is used in a known manner by the control means 15 to determine when the receiver 21 should be interrogated.

5 An authorised user who wishes to operate the bolt 13 enters a first set of information, for example a number, into the key 30 by means of the input elements 33. The control means of the key then causes the liquid crystal display 32 to present a predetermined, second set of information which is read by the reading means as the key shank is inserted into the driven member 11. Provided that this information is recognised as appropriate by  
10 the control means 15, the plunger 16 is retracted and the driven member 11 is freed for rotation. The user can then turn the key and driven member to move the bolt 13 and to operate the switch 14.

The information presented to the reading means by the key may be a number which constitutes the first set of information input to the key.  
15 Alternatively, the key may present to the reader a different number related in a predetermined manner to the input number. In a further alternative arrangement, the key may have a memory and means for comparing with a first number in the memory information input to the key and, if the input information corresponds to the first number in the memory, to cause the key  
20 to present to the reading means a second number, which may be unrelated to the input number except by the memory of the key. Thus, an appropriate number can be applied to the apparatus without the user of the key having knowledge of that number.

25 The means 37 in the driven member 11 may interact with the key to bring about energisation of the liquid crystal display 32 only when the shank 31 is inserted in the driven member and to de-energise the display upon commencement of withdrawal of the key shank from the driven member. Alternatively, the display 32 may be energised immediately upon completion  
30 of entering of the first set of information into the key, which would normally be carried out before the key shank is inserted in the driven member, but could be carried out after insertion of the key shank. The control means of the key 30 is preferably arranged to re-set the liquid crystal display 32 after elapse of a predetermined period of time, so that the second set of  
35 information can be read from the key only during a limited period following entering of the first set of information into the key.

As the driven member turns, it exerts force on the carriers 23 and 24 and moves these carriers apart. It will be noted that the carriers do not participate in rotation of the key and driven member 11. If required, the driven member can be rotated through more than one revolution to operate the bolt 13, switch 14 or other associated devices.

5 The memory of the key 30 may contain one or more sets of information which is recognised by the control means 15 as a command to change the information stored in the first memory of the control means 15. An authorised user can cause this set of information or one of these sets of information to be presented by the liquid crystal display, by entering an  
10 appropriate set of information via the input elements 33. If the key 30 is then applied to the driven member 11, the contents of the first memory of the control means 15 can be so changed that a set of information which would, before the change, free the driven member 11 for rotation will not do so after the change. In this way, a previously authorised user can be  
15 prevented from operating the bolt 13, without being dispossessed of his key.

There may be provided for use with the driven member 11 one or more keys capable of operating the bolt 13 but incapable of changing information in the first memory of the control means 15 and one or more further devices, similar to the key 30, capable of changing information in the first memory of  
20 the control means 15. These further devices may also be adapted to receive information from the control means 15, for example via the emitter 20.

An information carrier which is required also to receive information from the apparatus would be provided with an additional receiver responsive to radiation from the emitter 20 when the carrier has been fully inserted to  
25 provide an electrical signal to the memory of the carrier.

The shank 31 of the key incorporates a rigid frame defining an opening in which the liquid crystal display is mounted. The frame of the key shank is formed of metal or other relatively strong material so that the key shank has mechanical strength similar to that of known keys used for engaging  
30 mechanically moved tumblers. Thus, the key is suitable for transmitting substantial torque to the driven member without deformation of the key occurring. The key shank preferably has a thickness which is at least one tenth the other transverse dimension of the key shank. In this way, the key shank is provided with substantial torsional stiffness.  
35

Energy for driving the control means and liquid crystal display of the key is provided by a battery 38 incorporated in the key.

In place of the liquid crystal display 32, there may be provided a single source or more than one source of radiation, for example infra-red emitters. In this case, the control means of the key would preferably be arranged to bring about transfer of information from the key to the reading means once  
5 the key had been fully inserted into the driven member 11. Alternatively, the key may be provided with an array of radiation emitters which are energised selectively in accordance with the information to be transferred to the reading means, transfer taking place during insertion of the key shank into the driven member 11. In this case, the reading means may have only a single  
10 receiver which responds to the radiation emitted from the key.

In a further alternative arrangement, there is provided in the window of the key an array of permanent marks which represent, in an encoded form, information to be presented by the key. This array of marks is covered by a screen which is opaque to visible light and which is transparent to infra-red  
15 radiation when set in a transparent condition by the control means of the key.

Although we prefer to provide a battery in the key, the key may alternatively be arranged to receive energy from the device shown in figure 1. For this purpose, the key and the device may be provided with respective electrical contacts which co-operate during insertion of the key. In a further  
20 alternative arrangement, the apparatus of figure 1 and the key may be provided with respective inductive elements which transfer energy inductively when the key is inserted.

In figure 4, there is illustrated an alternative key for use in conjunction with the apparatus of figure 1. The key of figure 4 has a shank 39  
25 incorporating presentation means which includes a plurality of sliders 40 mounted in the shank for limited reciprocation relative thereto along respective parallel paths which extend transversely of the length of the key shank. The sliders are adapted collectively to present in a window defined by the key shank 39 information which can be read by the device of figure 1,  
30 when those parts of the sliders lying in the window of the key shank are scanned by the infra-red beam. In one embodiment, each slider is formed of material which is opaque to infra-red radiation and defines an opening through which such radiation can be transmitted. In another embodiment, each slider is formed of material which is transparent to infra-red radiation  
35 and bears a mark which is opaque to such radiation. The dimension of each opening or mark, as the case may be, which extends laterally of the key shank is no greater than the width of the window defined by the key shank. Each

slider can be moved laterally with respect to the key shank between a position in which the mark or opening is presented in the window and a further position in which the mark or opening is concealed within the key shank.

5 To facilitate setting of the sliders 40 in selected positions, each slider is provided at one or each of its ends with a protuberance 41. These protuberances collectively constitute the input receiver of the key and the user can set the key in a condition in which it presents selected information to the reading means by depressing selected ones of the protuberances. The  
10 presentation means of the key shown in figure 4 may be directly accessible by a user in the window defined by the key shank 39. Thus, setting of the presentation means may be effected by means of a tool, for example a pen, engaged with a slider in the window of the key shank. Alternatively, the presentation means may be covered by a cover which is present in the window  
15 defined by the key shank and which may be opaque to visible light or transparent to both visible and infra-red light.

In a case where the device of figure 1 is to be used with the key of figure 4, the device is preferably modified by the addition of resetting means for resetting the presentation means of the key automatically upon  
20 withdrawal of the key shank from the driven member. The resetting means may comprise a pair of shoes 42 mounted in the driven member adjacent to the mouth of the key slot and movable between respective projected positions in which they lie in the key slot and respective withdrawn positions in which they are spaced from the key slot. During insertion of the key shank 39 into  
25 the key slot, the shoes would remain in their withdrawn positions, so as not to disturb the setting of the presentation means. After reading of information from the presentation means, the control means 15 would cause both shoes 42 to move into their projected positions. Upon withdrawal of the key shank from the key slot, the shoes would then engage any of the protuberances 41  
30 which project a substantial distance from the key shank and bring about mutual alignment of the sliders 40 so that, when withdrawal of the key shank has been completed, the sliders would occupy the positions illustrated in figure 4. Alternatively, resetting means may be omitted from the device of figure 1, the user manually resetting the sliders after withdrawal of the key.

35 In place of the optical reading means hereinbefore described, there may be provided inductive reading means. Thus, the key and the device of figure 1 may be provided with respective coils, between which signals can be

transferred to convey information between the key and the apparatus. Radio frequency transmission may be used to transfer information between the key and the apparatus.

5       The key of figure 4 may be modified by the provision of sliders, with each of which there is associated a permanent magnetic field. The form of the field of the key would then be determined by the relative positions of the sliders and could be set by the user, prior to reading of information from the key by coils or by other devices responsive to changes in a magnetic field.

10       The key of figure 4 may alternatively be modified by the provision of sliders, each of which is adapted to present information to be read mechanically by a reader. For example, the device of figure 1 may be modified by the provision of an element which operates in the manner of a pin tumbler, is engaged by the protuberances 41 at one margin of the key shank and which itself operates a switch or other means for providing an  
15       electrical signal representing the pattern of the protuberances 41. Similarly, the sliders could be adapted to present mechanical formations in the window of the key shank, these formations being engaged by an element which transmits motion to a switch or the like.

20       In figure 5, there is illustrated a further alternative key which is intended for use with apparatus generally as hereinbefore described and as shown in figure 1, but modified to accept a cylindrical key shank in place of the shank of rectangular cross-section which is inserted into the key slot of the apparatus of figure 1.

25       The shank of the key shown in figure 5 has a core 47 which is fixed with respect to a handle 43 of the key. On the core, there is mounted a number of annular components 44 which can be turned relative to each other about a longitudinal axis of the core. Co-operating detent means may be provided on the core and each element to define alternative rotary positions of the elements. Each element can be turned by hand to a selected position.

30       Each of the elements defines at its periphery at least one depression 45 which is exposed at the surface of the key shank. The elements can be turned to bring their respective depressions into alignment longitudinally of the key shank or to establish mutual alignment of selected depressions only, the other depressions being out of alignment with the selected depressions. For reading  
35       information from the key of figure 5, the device of figure 1 is modified by the provision of reading means adapted for sensing the presence or absence of a depression at selected positions along the key shank. An example of such reading means comprises an element which operates in the manner of a pin tumbler and a switch or other means for providing an electrical signal in response to movement of the element. The arrangement would be such that



an end portion of the element can enter the keyway to a limited extent and thereby enter any depression 45 which is aligned with the element of the device of figure 1, when the key shank is introduced into the keyway. The reading means would thereby provide a train of electrical pulses, one for each depression entered by the tumbler-like element.

5 In order to operate apparatus using the key of figure 5, the user sets predetermined depressions 45 in alignment for co-operation with the reading means and sets other depressions out of alignment so that those other depressions will not co-operate with the reading means. The key shank is  
10 then inserted into the keyway of the apparatus and, once the correct information has been read from the key, is turned to operate the apparatus. After withdrawal of the key from the apparatus, the user moves at least some of the depressions defined by the key shank so that the correct setting will not be revealed to any one who is subsequently able to inspect the key.  
15 Thus, loss of the key does not result in loss of security of the controlled apparatus.

To facilitate setting of the depressions 45, numbers or other indicia may be marked around the circumference of the annular elements of the key shank.

20 In addition to the depressions 45, there may be provided on each of the annular components 44 a number of additional depressions having depths and/or diameters which differ from those of the depressions 45 and which may also differ from those of other depressions. These additional depressions will further confuse any one finding a lost key and wishing to make  
25 unauthorised use of that key or to make an unauthorised, substitute key. Movement of one of the additional depressions past the tumbler-like element would not cause the reading means to provide an electrical signal identical with the signal provided when one of the formations 45 moves past that element.

30 In a similar way, the key of figure 4 may be modified by provision, in at least some of the sliders 40, of additional openings or marks having dimensions different from those of the marks or openings shown in the drawing.

35 There may be provided for use with the key of figure 4 or for use with the key of figure 5 a setting tool for setting the key into the first condition, in which it presents to the reading means predetermined information which will be recognised by the processor. Such setting tool would be carried by the

user separately from the key, so that loss of the tool and key together would be unlikely. The key may be set into the first condition by inserting the key into the tool, turning the key relative to the tool and then withdrawing the key. In the case of a tool intended for setting the key of figure 4, there would be provided internally of the tool ramps for engaging appropriate one  
5 of the protuberances 41 during turning of the key. In the case of the key shown in figure 5, each of the annular components 44 may be provided with a projecting tooth for co-operation with a corresponding formation in the setting tool so that rotation of the key-handle relative to the setting tool causes rotation of the components 44 relative to the core 42, in at least some  
10 cases with lost motion, to establish a predetermined relation between the components 44. In either case, the setting tool may also be adapted for setting the key to the second configuration, after use.

It will be noted that in the case of each form of presentation means hereinbefore described, the presentation means can be subjected repeatedly  
15 to a cycle in which selected or predetermined information is presented for reading by the reading means and presentation of that information is then terminated.

It will be understood that the device shown in figure 1 may be adapted for controlling the operation of a machine or of electrical apparatus not  
20 provided with a bolt. The apparatus illustrated in figure 1 may be incorporated in a cash dispenser or a telephone to control use thereof.

Provision may be made for remote access to the first memory of the control means 15, so that the information stored in the first memory can be changed. Such remote access may be via a plug and socket connection, the  
25 socket being provided in the body 10, or may be via permanently installed wiring. Provision may also be made for remote control of the plunger 16 without insertion of an appropriately coded key into the driven member 11. Provision may also be made for remote indication of application of a key to the driven member 11, when that key is applied, and of the identity of the  
30 key so applied.

The features disclosed in the foregoing description, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, may, separately or in any combination of such features, be  
35 utilised for realising the invention in diverse forms thereof.

## CLAIMS:-

1. The combination comprising an information carrier (30) and a reader for reading information presented by the carrier, wherein the information carrier is settable in a first condition in which it presents to the reader a predetermined set of information or a selected one of a plurality of predetermined sets of information and the information carrier can assume a second condition in which it does not present said predetermined set of information or said selected set of information.
2. A combination according to Claim 1 wherein a cycle of changes between the first and second conditions of the information carrier can occur a plurality of times.
3. A combination according to Claim 1 or Claim 2 wherein the information carrier comprises presentation means for presenting information to the reader and the presentation means is accessible to a user for setting of the carrier in the first condition.
4. A combination according to Claim 3 wherein the presentation means of the information carrier comprises a plurality of relatively movable elements and the relative positions of said elements determines the information presented by the carrier.
5. A combination according to Claim 1 or Claim 2 wherein the information carrier includes a receiver (33) for receiving information from a user, presentation means (32) for presenting information to the reader and control means (33a) for controlling the presentation means in accordance with input information applied by a user to the receiver.

6. A combination according to Claim 5 wherein the input receiver comprises a plurality of elements sensitive to touch or to pressure exerted by a user.
- 5 7. A combination according to Claim 5 wherein the control means of the information carrier includes a memory and processing means for comparing input information with information in the memory and for selecting from the memory in accordance with the input information further information which is to be presented to the reader.
- 10 8. A combination according to Claim 5 wherein the presentation means is adapted to present the information in a form such that the information can be transferred to the reader by radiation.
- 15 9. A combination according to any preceding Claim wherein the reader has means for setting the information carrier in the second condition.
- 20 10. A method of operating apparatus wherein an information carrier is applied to the apparatus, information is read from the carrier of the apparatus, reading of said information from the carrier by the apparatus promotes or enables operation of the apparatus, wherein the information carrier is caused to assume prior to, during or after application of the carrier to the apparatus, a first condition in which the carrier presents said information for reading by the apparatus and wherein the information carrier is previously in and/or assumes subsequently a second condition in which the information carrier does not present said information for reading by the apparatus.
- 25 11. A method according to Claim 10 wherein, after reading of said information from the carrier, the carrier is set by the reader in said second condition.
- 30 12. A method according to Claim 9 or Claim 10 wherein the information carrier assumes said first condition in response to application by a user to the information carrier of a set of input information.
- 35

13. A key for use in a method according to Claim 10 having an array of elements for presenting a set of information and means for setting the array in a condition in which a predetermined set of information is presented.

14. Any novel feature or novel combination of features disclosed herein or in the accompanying drawing.

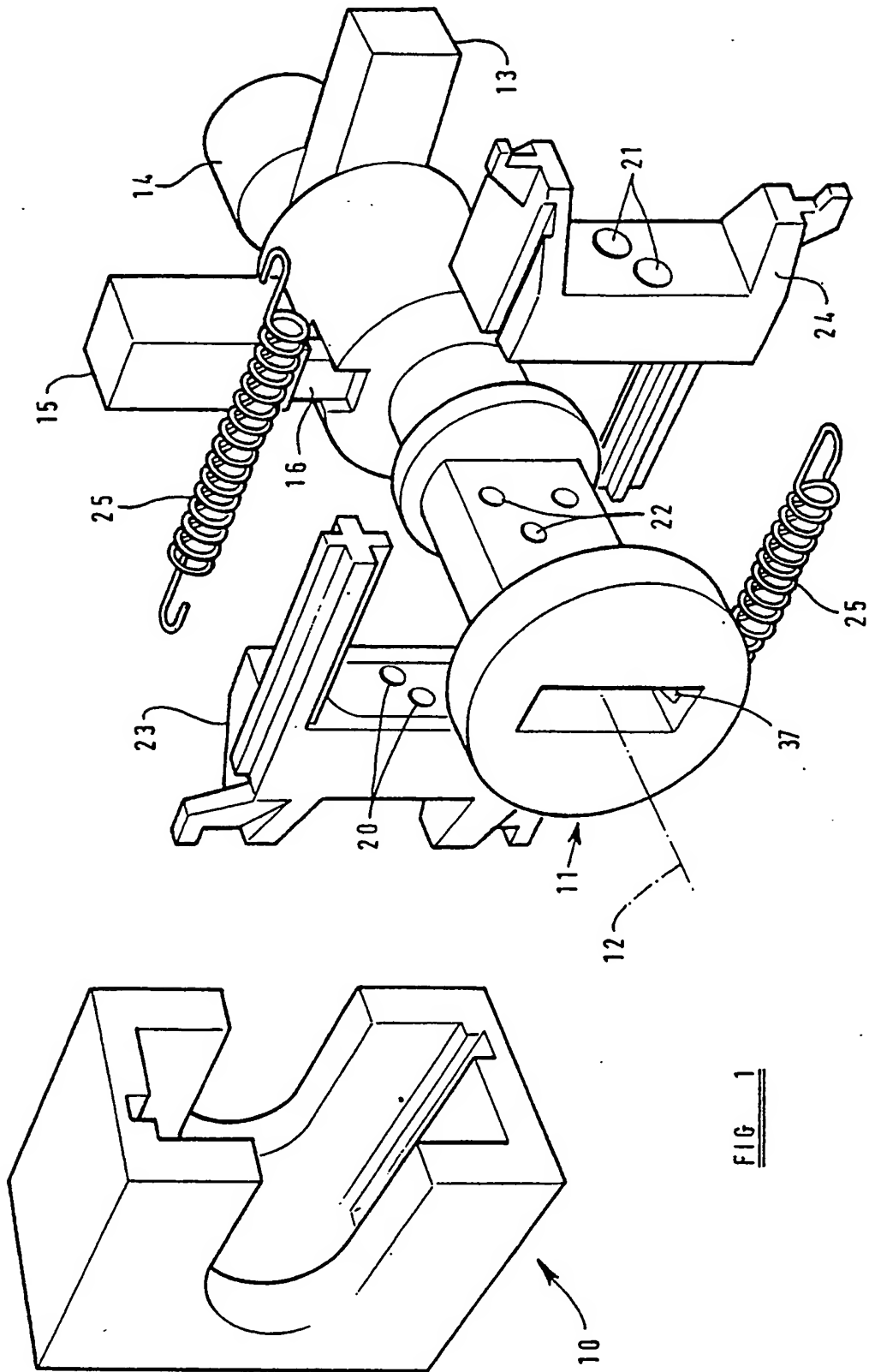


FIG. 1

2/2

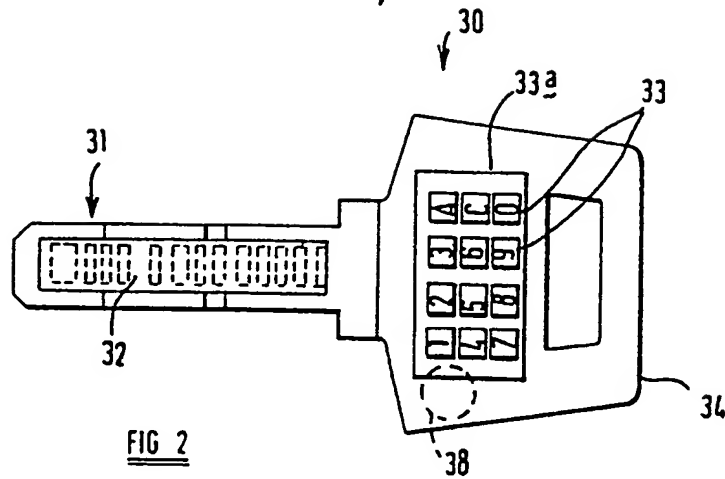


FIG 2

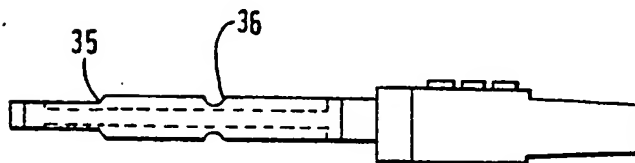


FIG 3

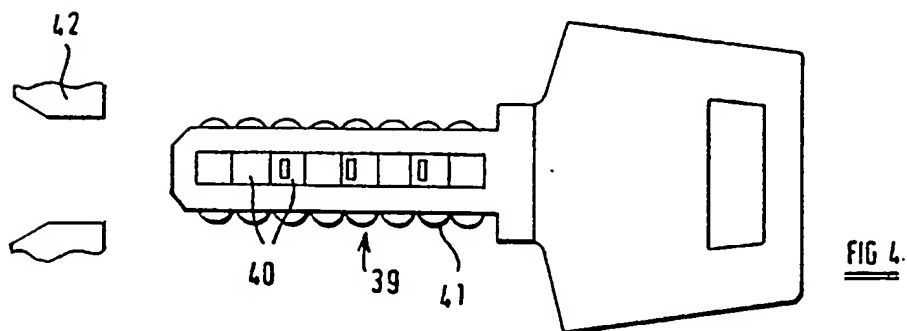


FIG 4.

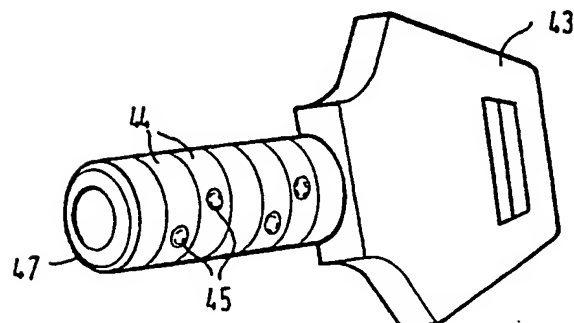


FIG 5

# ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/GB 85/00263 (SA 9904)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 02/10/85

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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FR-A- 2428129	04/01/80	GB-A, B 2022187	12/12/79
		DE-A- 2824684	20/12/79
		JP-A- 54163198	25/12/79
		GB-A, B 2072742	07/10/81
		US-A- 4317156	23/02/82
		SE-A- 7904778	07/12/79
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For more details about this annex :  
see Official Journal of the European Patent Office, No. 12/82



# INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 85/00263

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) * According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC <sup>4</sup> : E 05 B 49/00		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched *		
Classification System :	Classification Symbols	
IPC <sup>4</sup>	E 05 B	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched *		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT *</b>		
Category *	Citation of Document, ** with indication, where appropriate, of the relevant passages **	Relevant to Claim No. **
X	FR, A, 2528201 (LEWINER, HENNION) 9 December 1983, see page 2, line 16 - page 3, line 16; page 3, line 33 - page 9, line 2	1-3,5-8,14
A	---	12
A	FR, A, 2428129 (SACHS SYSTEMTECHNIK) 4 January 1980, see page 10, line 11 - page 11, line 10	4
A	WO, A, 83/01642 (PERKUT, ANETSEDER) 11 May 1983, see page 8, line 27 - page 9, line 18	13
A	US, A, 4209782 (M. WACHTLER) 24 June 1980, see column 3, lines 25-45; column 10, lines 35-56	1,2,9-11,13
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* Special categories of cited documents: ** "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "Δ" document member of the same patent family		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
12th September 1985	10 OCT. 1985	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE	G.L.M. Krüger	